

ABANDONED URANIUM MINES PROJECT ATLAS

APPENDIX A.4b

USACE FIELD OPERATIONS SUMMARY

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PROJECT GOAL

The Integrated Assessment (IA) process is for assessment for emergency or non-time critical removal actions and for collecting data for future use if remedial action is needed. At a few sites within the USEPA IA study areas, limited information had been obtained from preliminary studies, such as Preliminary Assessments (PA) and Site Inspections (SI), conducted by the Navajo Environmental Protection Agency (NNEPA). The USEPA IA was designed to build upon this available information by collecting additional data through site reconnaissance, and collecting environmental samples to analyze for the presence of hazardous substances.

The six areas investigated are historic mining districts in Arizona, Utah, and New Mexico. Each of these areas contains abandoned uranium/vanadium mines. The areas are: Four Corners, Monument Valley, Cameron-Tuba City, Bidahochi, Central Area-Many Farms/Rough Rock, and Chinle. USEPA has previously conducted water sampling and analysis in the Four Corners-Red Valley/Beclabito area. The results of that work were presented in the *Site Integrated Assessment, Navajo Uranium Mines - King Tutt Mesa Study Area, Red Valley Chapter, Navajo Nation, Oak Spring, New Mexico 87420 (Draft for Comment by BEI, June 1997)*.

Available information for certain sites within the study areas indicated the presence of several naturally occurring isotopes of uranium, thorium, and radium, as well as metals such as arsenic, lead, mercury, antimony, beryllium, cadmium, selenium, and thallium in water used for human consumption.

PROJECT FIELD SAMPLING PLAN DEVELOPMENT

The Field Sampling Plan (FSP) was prepared by Bechtel Environmental, Inc., (BEI) in cooperation with USEPA and USACE. The sampling described in the FSP was part of an IA under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund). The FSP addressed sampling and analysis of water used for human consumption within the boundaries of the Navajo Lands in Arizona, New Mexico, and Utah.

DESCRIPTION OF SAMPLING PROGRAM

The purpose of the USEPA IA was to evaluate risks to human health by ingestion of radionuclide and metal contaminants in water. Therefore, the sampling program was designed to measure analyte concentrations in water sources used for human consumption within the study areas. The sampling program consisted of collecting one water sample at each well, tap, spring, pit, or tank identified as a source for human consumption. If there was a common source for multiple users, such as a community well or tap only the common source location will be sampled. All samples were collected as a point of use sample designed to duplicate the most likely method in which a person would obtain water for human consumption.

Samples were collected at locations determined in the field based on interviews with representatives of the Navajo Chapters in the study areas. Initial information was obtained using field questionnaires and community contacts. Not all of the known wells were sampled, as many were abandoned, sealed, or not usable for obtaining water suitable for human consumption.

DESCRIPTION OF ANALYTICAL PROGRAM

Radioisotopes for analysis were selected by reviewing all of the radioactive isotopes in the naturally occurring Uranium²³⁸, Thorium²³², and Uranium²³⁵ decay chains. The radioisotopes selected for analysis were those which: 1) are abundant; 2) are persistent (that is, have relatively long half-lives); 3) have established analytical methods; and 4) have established Preliminary Remediation Goal s (PRGs) or Maximum Contaminant Levels (MCLs). These are Lead²¹⁰; Radium²²⁶ and Radium²²⁸; Thorium²²⁸, Thorium²³⁰, and Thorium²³²; and Uranium²³⁴, Uranium²³⁵, and Uranium²³⁸. Measurement of these radioisotopes allowed a comprehensive assessment of the risks due to naturally occurring radionuclides. In addition, analysis was conducted for gross alpha and beta activities because they provide a gross screening assessment.

The rationale for selection of the metals analytes was that heavy metals are commonly found in association with mining activity or ore processing. While certain heavy metals such as arsenic or lead are more likely to be associated with mining areas, measurement of Contract Laboratory Procedures (CLP), Target Analyte List (TAL), metals was recommended for several reasons. First, using this comprehensive analytical suite enabled a more thorough assessment of the cumulative effects of multiple radiological and metal contaminants and chronic low-level risk associated with concentrations in water. Second, measurement of the full suite of metals is routine and can be done at little additional cost. Third, the information regarding TAL metals, even if not necessarily associated with mining activities, may be useful to future investigators.

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USACE PROJECT PLANNING HISTORY

On November 17, 1997, the USEPA and the USACE began discussions regarding working together on the Abandoned Uranium Mines Study on the Navajo Lands. The USACE initiated development of work plans and training standards to prepare team members to assist the USEPA Region 9 and Bechtel Environmental, Inc., in the fieldwork.

On March 10, 1998, the USEPA and the USACE, Los Angeles District, entered into an Inter-Agency Agreement (IAG), No. DW96955370-01-0. The IAG was established with the purpose of providing technical and field support to USEPA Region 9.

On March 13, 1998, the USACE submitted to Patti Collins, Project Manager and Senior Scientist of USEPA Region 9, a list of team members for her approval. In a letter, dated April 9, 1998, Patti Collins selected Glynn Alsup as the Field Project Manager. Other team members included:

Brian Jordan, Project Chemist
David Hays, Project Health Physicist
Dr. James Tang, Industrial Hygienist/Occupational Health
Jeffery Devine, Geologist
Mark Chapman, Geologist
Wayne Schiemann, Environmental Engineer
Steve Messinger, Environmental Engineer.

During the 1998-1999 field season, USEPA added Data Management to USACE's tasks. To accomplish this task, USACE added the following members to our team:

Rich Meyer, Ph.D., Chemist
Shel McQuire, Chemist
Laurie Percifield, Chemist
John Nebelsick, Chemist
Art Moncayo, Lab Technician
Raymond Salas, Lab Technician
Jim Miller, Lab Technician.

Jeffery Franklin, Environmental Scientist and Julie Molton, Environmental Engineer, of CH2M Hill had joined the field team for one week in January 2000 to assist in operating the bacterial laboratory.

During the months of March and April 1998, the USACE had meetings with Kim Geisler of Bechtel Environmental, Thane Hendricks and Jim Beckett of DOE, Patti Collins and Vicki Rosen of USEPA Region 9. During this time team members reviewed maps, previous studies and developed work plans. Team members coordinated computer systems so they could maintain electronic files between all agencies.

On April 22, 1998, USACE met with Bechtel Environmental in San Francisco to review historical files on the uranium mining on the Navajo Lands. During the following week, USACE reviewed the following documents to prepare for the work on the Navajo Nation:

Grand Canyon Geology by Stanley Beus and Michael Morales, New York Oxford, Oxford University press, Museum of Northern Arizona Press, 1990.

Previous Bechtel Environmental contract files, home surveys, Integrated Assessment and field reports from the 1994 study.

Technical Resource Document Extraction and Beneficiation of Ores and Minerals, Volume 5, Uranium, USEPA, Office of Solid Waste, Washington D.C.

Geohydrology and Water Chemistry of Abandoned Uranium Mines and Radiochemistry of Spoil Materials Leachate, Monument Valley and Cameron Areas, Arizona and Utah. U.S. Geological Survey-Water Resources Investigation Report 93-4226 with the NNEPA.

Regional Hydrogeology of the Navajo and Hopi Indian Reservations, Arizona, New Mexico and Utah, Geological Survey Professional Paper 521-A, BIA and Navajo Tribe.

Work Plan dated June 1995.

Testimony of the Navajo Nation Before The Subcommittee on the Native American affairs Regarding Abandoned Uranium Mines on the Navajo Nation, dated November 4, 1993.

If You Poison Us Uranium and Native American by Peter H. Eichstaedt.

Radioactive Occurrences and Uranium Productions in Arizona (Final Report) Arizona Bureau of Geology and Mineral technology- March 1981.

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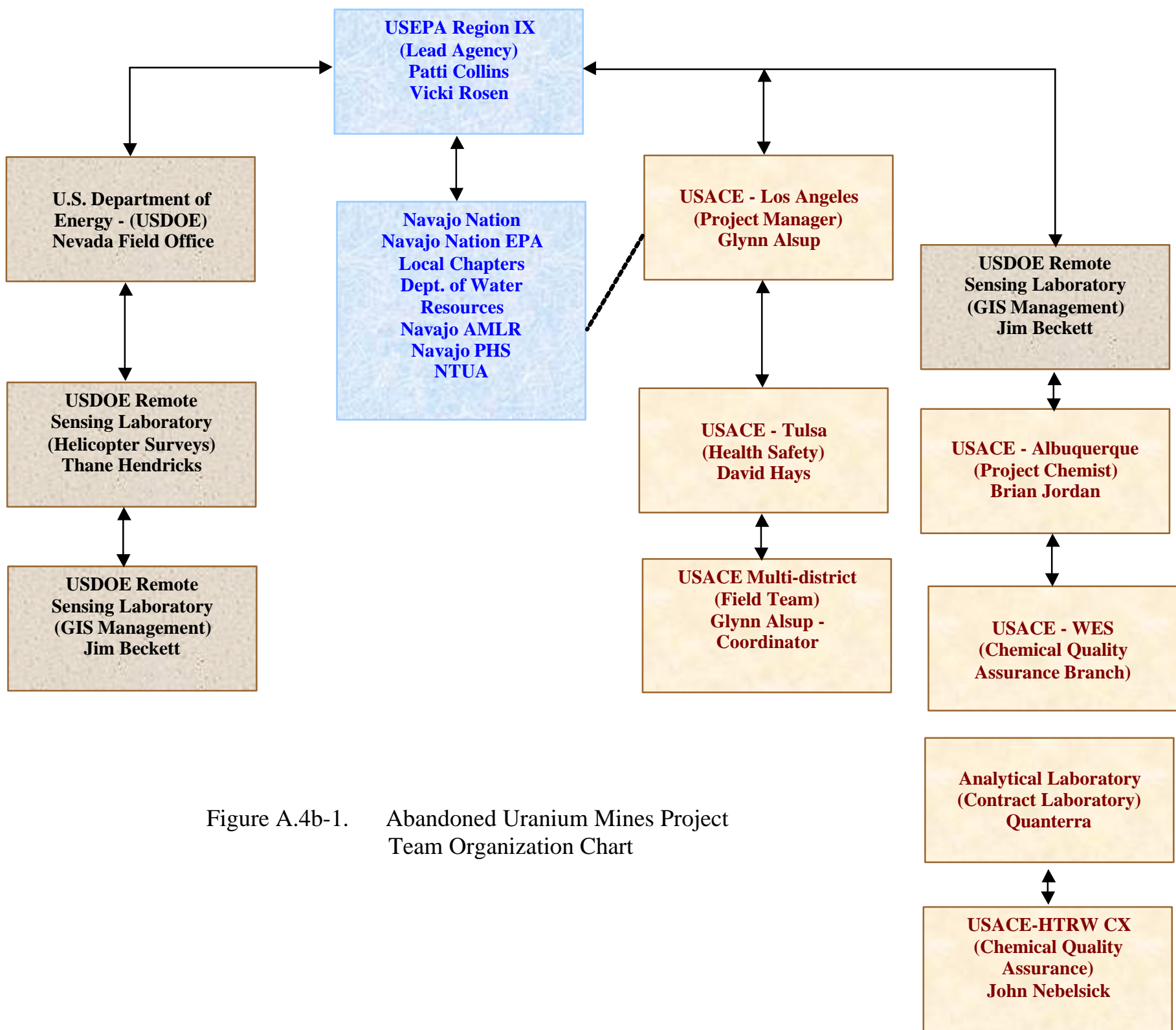


Figure A.4b-1. Abandoned Uranium Mines Project Team Organization Chart

These documents provided a wealth of information used in the development of the project's safety plan, project sampling plan and work plans. On May 30, 1998, the USACE submitted to USEPA Region 9 Book I, General Guidance, Navajo Abandoned Uranium Mines, United States Environmental Protection Agency Region 9 and Book 2, General Guidance, Volume 2, Navajo Abandoned Uranium Mines, United States Environmental Protection Agency Region 9. USACE also submitted the Field Home Survey Form, Daily Safety Form, Daily Reports Forms and QA/QC Forms that would be used in the fieldwork for approval by USEPA Region 9. On the April 1, 1998, USACE submitted the site-specific safety plan in electronic form to USEPA, with a signed copy given on June 6, 1998.

Bechtel Environmental, Inc., developed the sampling plan in cooperation with USEPA Region 9 and the USACE. Bechtel Environmental, Inc. was going to provide the data management and the laboratory for the project. In June 1998, Bechtel Environmental, Inc., informed USEPA Region 9 that they could not furnish a laboratory. USEPA Region 9 asked USACE if they could provide a contract with Quanterra Environmental Laboratories. USACE's project manager and project chemist went to Omaha, Nebraska, on June 8-11 to make arrangements for the USACE to provide a laboratory. With diligent efforts from Brian Jordan, Doug Taggart, Glynn Alsup and John Nebelsick the contract was in place at the end of the week.

Bechtel Environmental, Inc., with assistance from USEPA Region 9 and the USACE prepared the Field Sampling Plan on May 11, 1998. This copy was reviewed by Patti Collins, USEPA Region 9, Vance Fong, USEPA, B. Lee, Bechtel Environmental, Inc., and Glynn Alsup and Brian Jordan, USACE. After review comments were received by various agencies, Bechtel Environmental prepared Revision I completed on June 24, 1998 (see Supporting Documentation Books 13 and 14). This revision addressed the comments and responses supplied by National Air and Radiation Environmental Laboratory (NAREL), USEPA Region 9 and the USACE. This revision also has a summary of revisions of the May 11, 1998 submittal. The USACE received an electronic copy on June 24, 1998.

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On May 21, 1998, USEPA, USACE and NNEPA had a meeting in Window Rock with the following personnel present: Melvin Badonie, Department of Water Resources, Ft. Defiance, Arizona; Lydelle Davies, Eugene Esplain, Stanley Edison, Levon Benally, Jr., of NNEPA, Superfund Section; Tom Morris, NNEPA, Water Quality; Ray Russell and Perry Charley, AML Reclamation of Abandoned Mine Lands; Juanitor R Francis, Navajo Tribal Utility Authority (NTUA); Patti Collins and Vicki Rosen of USEPA Region 9, and Glynn Alsup, USACE. The agencies discussed the purpose of the project, the schedule, the work plans, areas to be covered, protocols for sampling, and established contact points. Glynn Alsup, USACE, would discuss the progress and findings with Stanley Edison, NNEPA. Stanley Edison would then brief the Navajo Agencies on the work accomplished.

On May 27, 1998, USACE met with DOE in Las Vegas, Nevada, and went to the Nevada Test Site to test the GPS and radiation monitoring equipment.

On May 28, 1998, Glynn Alsup, USACE, and Vicki Rosen, USEPA, met with chapter officials establishing appointments with the chapters to discuss sampling in their areas. Field work began on June 28, 1998.

In the early part of January 1999, USACE was asked by USEPA Region 9 to manage the data for the project because Bechtel's contract was expiring. USACE developed a Data Management Plan for the project and submitted the plan for USEPA's approval on January 20, 1999. To accomplish the data management task, Brian Jordan, USACE, was moved from the fieldwork to an office position to manage the data returning from the laboratory (see Supporting Documents Book 3). Brian Jordan was replaced in the field with two laboratory technicians from the USACE's El Monte laboratory. Arthur Moncayo and Raymond Salas alternated every two weeks (see Figure A.4b-1).

USACE mobilized the team for sampling on June 26, 1998. Over the weekend, USACE inventoried supplies, calibrated equipment, conducted a team meeting and preparatory meeting reviewing all work plans, safety plans, forms, Material Safety Data Sheets (MSDS), and work protocols.

TRAINING AND SAFETY

USACE Tulsa District provided assistance with training and safety reviews. USACE conducted training for all field personnel in Los Angeles and Phoenix before field work began. Each person is trained in Hazardous Toxic Radiological Waste (HTRW), Off-Road Driving, CPR, Radiation Training, first aid and cultural issues. USACE Tulsa District's Health Physicist reviewed the project work plan and the project health and safety plan. They compared the plans to the USACE requirements of EM 385-1-1, ER 385-1-80 and EM 385-1-80.

All personnel had previous field experience in sampling or oversight on Superfund projects. Before work began, each individual read the project plans and they were trained on specific procedures required on this project.

Thermo-Luminescence Dosimeters (TLD) were provided to the USACE Project Manager. The Project Manager maintained daily distribution of the TLDs to each employee. The TLDs were then returned to USACE Tulsa District to Process through the U.S. Army Ionizing Dosimeter Center (USAIRDC) in accordance army regulations and directives.

FIELD PROTOCOLS

Our sampling protocol directed the USACE Project Manager to meet with chapter officials to discuss daily work. Historical mining documents, radiation surveys, area maps with USGS spring and water source locations and Chapter Officials' knowledge of their areas were used to determine sampling points of water sources used for human consumption. The team had developed 1:100,000 area planning maps with GPS coordinates for the areas wells, springs and known water sources and the known locations of mines in the sampling area. This information was used to determine sample locations requested by chapter officials.

After analytical laboratory results from the samples were received, USACE were to return to the chapters with the information. Local chapters officials would then assist in determining if additional samples or follow-up sampling to determine if an alternative water source was available. On the follow-up samples, bacterial sampling would be conducted.

At each chapter, the USACE Project Manager met with the chapter officials, giving them a copy of the planning map for their area. The planning maps showed the locations of abandoned mines determined from old mining claims, historical documents and helicopter surveys. The maps also contained USGS data of known springs, wells and water sources located in the area. The protocols required the field team to sample water sources requested by the Chapter Officials. The conditions for a water source to be sampled were: (1) it had to be a water source used for human consumption, (2) be requested by a chapter official, (3) or requested by NNEPA personnel.

Each morning the field equipment was calibrated and documented on the Daily Calibration Form. Daily safety meetings were conducted and documented on the Toolbox Safety Form.

At each sample, the field team maintained a daily field log, an electronic field log, a video of the site, a 35mm photo of the site and on most sites, a digital photo of the site. The video was used as a visual field log. The tapes were not edited. The tapes enable agencies to have a visual document of the sampling event and the conditions at the time of the sample.

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Glynn Alsup, USACE Project Manager, or Brian Jordan, USACE Project Chemist, maintained the Chain of Custody forms. At each sampling event, the sample labels were completed and the chain of custody forms were filled out before USACE left the site. All coolers were maintained in storage in the motel rooms when not used in the field for sampling. Team members would inspect the samples before shipment, checking the labels, the chain of custody forms and the packaging of each bottle. The bottles were each doubled bagged in zip-lock bags inside the coolers. The chain of custody form was completed for shipment, and placed in a zip-lock bag and taped to the inside of the lid of the cooler. Each cooler was strapped with two high-strength taped wraps with a minimum of two wraps per strap. Custody seals were placed on two hinges. Glynn Alsup would notify Brian Jordan and the USACE's Omaha laboratory that the samples were ready for shipment. Brian Jordan maintained a spreadsheet to document the Fed-Ex tracking number, the shipment date, the date of receipt, and would follow the holding times through the laboratory. Upon arrival at the USACE's Omaha lab, the laboratory would open the cooler and inspect the contents and forms before sending the cooler to Quanterra Environmental Laboratories for analysis. USACE did not experience any lost shipments or any broken containers during shipment.

Each employee received annual physicals, and was monitored daily with a Thermo-Luminescence Dosimeter (TLD). Glynn Alsup, the on-site Radiation Safety Officer maintained the TLDs and the control TLD. The TLDs were provided by David Hays, the Project Health Physicist and processed through a contract with an independent lab. David Hays also provided plan and document reviews, on-site training, oversight and monitoring of procedures to ensure the safety and health of the employees. Logs were maintained of the assignment of the badges, and reports were given to each person issued a badge. Permanent files are maintained by the USACE on exposures of each person issued a badge on the project.

RADIATION MONITORING

At each site, radiation levels were monitored and recorded. Radiation levels were recorded at a height of one meter from the ground surface. On home surveys, team members took measurements 25 feet away from the structure exterior, and four readings, north, south, east and west of the structure. Readings one meter from the surface of the structure were also taken. Readings inside the structures were taken when entry was permitted. Home surveys were provided as a service to Chapters, but were accomplished only when requested.

FIELD DOCUMENTATION

Daily Reports

Daily reports were kept for each day work was accomplished in the field. The Daily Report listed personnel on the site; the tasks accomplished for the day, TLD distribution, any variations to the safety plan, visitors on site, Chapter Officials contacted, and any additional comments. The Project Manager signed the daily reports. A review of the daily reports demonstrates the collection of the samples followed project requirements.

Sample Reports

Sample Reports were developed to list the sample ID, name of the site, date of sample, coordinates, elevation, PH, Conductivity, Oxidation Reduction Potential, and temperature of the water sample, radiation readings, number of samples taken, and comments.

Daily Calibration of Equipment Sheet

A Daily Calibration of Equipment Sheet was used to document the daily calibration of the equipment used. The data sheet listed the name of the equipment, serial number, model number, and proper operation or specific problems found during calibrations. The equipment on the calibration sheets are: Ludlum Model 19, Ludlum model 14C, ATI Orion PH Meter Model 265, ATI Orion Conductivity Meter, Landstar GPS Fieldworker Pro and Newton Message Pad. A review of the daily calibrations demonstrate the equipment used was calibrated before use in the field, ensuring accurate measurements were taken.

Toolbox Safety Meeting Report

The Toolbox Safety Meeting Report, SPL Form 393, documented the daily safety meetings. The report documents the date of the meeting, personnel in attendance, subjects discussed, and a brief outline of the topic discussed. The on-site Safety Officer and Radiation Safety Officer signed the daily report. The daily safety meetings attributed to an accident-free project with radiation exposure limits at ten percent of the allowable exposure limit.

Chain of Custody Forms

Chain of Custody Forms were maintained to record the handling of water samples from the field to the laboratory. Lab ID's were established to maintain data packages. The forms listed the client, address, project name, Project Manager and contact points, telephone numbers, signature of the sampler, analysis required, number of containers, sample ID number, date sample was taken, time of sample, sample type, type and size of container, method of preservation, signature blocks showing relinquished by and received by, method of shipment, shipment number, and comments. FedEx bills were maintained to track shipment to the laboratory and to document cost.

The chain of custody forms demonstrate proper care of the samples from the time of collection to receipt at the laboratory. No samples were lost during shipment. The Sample Log-In Sheet demonstrates the diligence used in tracking the samples from the field through the laboratory process to the receipt of data.

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USACE FIELD OPERATIONS SUMMARY

Field Overview Checklist

A Field Overview Checklist was maintained to document general procedures, safety, records, QA/QC procedures and custody of the sample.

Diligent effort was expended to document the sampling events and to maintain the integrity of the samples from the gathering of the sampling to the processing of the data. This was accomplished by acquiring highly skilled field personnel, training the field team to project standards and requirements, and by daily meetings to remind personnel of those standards and requirements.

Maintaining the checklist is demonstrated in the acceptance of all sample shipments with no problems noted.

CONCLUSION

The conclusions about the USACE field operations are in two parts:

1. Conclusions for work that was completed.
2. Conclusions for work that was planned but not completed.

Conclusions about work that was completed

By using aerial surveys conducted by DOE and USACE conducting field radiation surveys, home construction surveys and conducting extensive water sampling, USEPA was able to:

1. Identify radiation sources,
2. Assign health risk values for water used for human consumption,
3. Identify homes or structures needing remedial action, and
4. Characterize exposures in the areas studied.

The Sampling Plan and Data Management Plans were followed. The study was well documented from the fieldwork to the laboratory and into the final summary.

Our project Data Quality Objectives were met for the samples completed.

1. Data representative of the condition and quality with respect to the stable and radioactive metals in the water were collected and maintained.
2. Data are at levels of precision and accuracy such that the data can be compared and evaluated against standard benchmarks of human risk of consuming the water.
3. Data is of sufficient quality, documentation and verification to be available for use for the USEPA Superfund administrative and enforcement processes, including but not limited to the various removal and remedial actions intended for exposure reduction.
4. The data are presented in a format that is easily accessible to the end user.

Conclusions for work that was planned but not completed

On January 25, 2000, USACE received a letter from Michael Feeley of USEPA Region 9. A portion of the letter read as follows, "In response to a request from Derrith Watchman-Moore, Executive Director of the Navajo Nation Environmental Protection Agency (NNEPA), to cease all visits to tribal chapters, I am requesting that you begin demobilization of your field team immediately and complete the demobilization by January 31, 2000." USACE complied with USEPA's request to demobilize. On January 26, 2000 one vehicle and the USACE field team members returned to Los Angeles. The Project Manager stayed to process the remaining samples and to pack up the remaining equipment and supplies. Demobilization was completed on January 31, 2000.

The following planned activities were not completed:

1. Follow-up sampling.
2. Sampling in the eastern agency.
3. Sampling to determine alternative water sources.
4. Discussions with local chapters and agencies on methods to reduce radiation exposure.
5. Explaining the result to local chapter officials and communities.

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The circumstances for follow up sampling envisioned in the Field Sampling Plan and later analysis of field conditions falls into four categories.

1. During the planning for the project it was initially thought that community members may wish to bring samples for analysis to the project field team from remote water sources or culturally sensitive areas. If the sample from the community member showed concentrations at levels of concern a follow up sample collected by the field team would be warranted.

No follow up sampling is needed for this contingency. The field team using the sampling methods included in the FSP collected all samples.

2. If data quality issues arose concerning the representative nature of a sample with respect to the sampling methods employed or analytical method used for analysis it was to be followed up with an appropriate method of sample collection and analysis.

The one and only instance where a follow up activity was needed to better reflect the conditions encountered in the field is the ongoing Hydrogeologic Investigation being carried out at the Cameron mining pit Yazzie 312. Turbidity of the samples after a field filtration at 5 microns remained extensive enough to bias the water analysis. Modifications include the centrifuging of field samples to decrease suspended sediments contained in the pit water. The analysis of pit samples has been modified to more accurately quantify high concentration samples from the pit. A monitoring well has been installed to ascertain the impacts of the pit on groundwater in the area.

No follow up actions were required to evaluate the risk posed by these waters. Further investigations are ongoing to and warranted at these locations to evaluate exposure reduction activities.

3. Follow up actions were warranted where sample results were unusual or inconsistent with the data set as a whole or with regional information.

The Shonto well below the Rare Metals facility in Tuba City was referred to the Department of Energy for follow up sampling due to some unusual radiological findings from the spring with respect to other samples obtained from the Moenkopi Wash area. Subsequent sampling at the spring but at a different outlet has not shown the same unusual pattern of results. Shonto well has been added to the Department of Energy's monitoring program associated with the Rare Metals facility. This is the only location where unusual or inconsistent results were obtained with respect to other samples in the same area.

4. The finding of local alternative water sources to replace sources identified as having elevated risk was to initiate follow up actions.

This activity was started in the Coal Mine Mesa chapter but not completed prior to the decision to stop field activities. This sampling is needed for the purpose of finding of local alternative water sources to replace sources identified in the initial phase of the project as presenting a potential risk to the community members.

The field team adhered to the quality assurance/quality control procedures outlined in the plans. Documentation supports this compliance. The procedures followed ensured the quality of the data. Although additional work is needed to complete this study, the data gathered to this point complies with the project data objectives and project plans.